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JWARP > Vol.1 No.5, November 2009

OPEN ACCESS

Two Modified QUICK Schemes for Advection-Diffusion Equation of Pollutants on Unstructured Grids

PDF (Size:809KB) PP. 362-367 DOI : 10.4236/jwarp.2009.15043

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ABSTRACT

In this paper, two modified QUICK schemes, namely Q-QUICK and UQ-QUICK, for improving the precision of convective flux approximation are verified in advection-diffusion equation of pollutants on unstructured grids. The constructed auxiliary nodes for Q-QUICK/UQ-QUICK are composed of two neighboring nodes plus the next upwind node, the later node is generated from intersection of the line of current neighboring nodes and their corresponding interfaces. 2D unsteady advection-diffusion equation of pollutants is conducted for their verifications on unstructured grids. The numerical results show that Q-QUICK and UQ-QUICK have similar computational accuracy to the central difference scheme and similar numerical stability to upwind difference scheme after applying the deferred correction method. In addition, their corresponding CPU times are approximately equivalent to those of traditional difference schemes and their abilities for adapting high grid deformation are robust.

KEYWORDS

Unstructured Grids, Q-QUICK/UQ-QUICK, Numerical Computation, Advection-Diffusion Equation of Pollutants

Cite this paper

L. XING, "Two Modified QUICK Schemes for Advection-Diffusion Equation of Pollutants on Unstructured Grids," *Journal of Water Resource and Protection*, Vol. 1 No. 5, 2009, pp. 362-367. doi: 10.4236/jwarp.2009.15043.

References

- [1] R. S. mkiwicz, " Oscillation-free solution of shallow water equations for nonstaggered grid," *Journal of Hy-draulic Engineering, ASCE*, Vol. 119, No. 10, pp. 1118?1137, 1993.
- [2] J. Fletcher, " Computational techniques for fluid dyrtaralcs," *8pfinger-Vedag, Berlin*, No. 1, 1991.
- [3] J. Shi and E. F. Toro, " Fully discrete high-order shock-eaptunng numerical schemes," *International Journal for Numerical Methods in Fluids*, Vol. 23, pp. 241?269, 1996.
- [4] S. Sankaranarayanan, N. J. Shankar, and H. F. Cheoag, " Three-dimensional finite difference model for transport conservative pollutants," *Ocean Engineering*, Vol. 25, No. 6, pp. 425?442, 1998.
- [5] R. J. Sobey, " Fraetional step algorithm for estruaine mass transport," *International Journal for Numerical Methods in Fluids*, Vol. 3, pp. 567?581, 1983.
- [6] B. P. Leonard, " Simple high accuracy resolution program for convective modelling of discontinuities" *International Journal for Numerical Methods in Fluids*, Vol. 8, pp. 1291?1318, 1988.
- [7] B. J. Noye and H. H. Tan, " A third-order semi-implicit finite difference method for solving one-dimensional eon-vection-dlffusion equation," *International Journal for Numerical Method in Engineering*, Vol. 26, pp. 1615? 1629, 1988.
- [8] B. J. Noye and H. H. Tan, " Finite difference method for the two-dimensional advetion difusion equation" *Interna-tional Journal for Numerical Methods in Fluids*, Vol. 9, pp. 75?98, 1989.
- [9] A. Pollard, A. L. Siu, and L. W. Siu, " The calculation of some laminar flows using various discretization

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schemes," *Comp. Meth. Appl. Mech. Eng.*, Vol. 35, pp. 293-313, 1982.

- [10] S. V. Pantankar, *Numerical Heat Transfer*, McGraw-Hill, New York, 1980.
- [11] M. K. Patel and N. C. Markatos, "An evaluation of eight discretization schemes for two-dimensional convection-diffusion equations," *International Journal for Numerical Methods in Fluids*, Vol. 6, pp. 129-154, 1986.
- [12] L. Davidson, "A pressure correction method for unstructured meshes with arbitrary control volumes," *International Journal for Numerical Methods in Fluids*, Vol. 22, pp. 265-281, 1996.
- [13] Y. Saad and M. H. Schultz, "Gmres: A generalized minimal residual algorithm for solving nonsymmetric linear systems," *SIAM. J. Sci. Stat. Comput.*, Vol. 7, 1986.
- [14] B. P. Leonard, "Third-order finite-difference method for steady two-dimensional convection," *Numerical Methods in Laminar and Turbulent Flow*, pp. 807-819, 1978.
- [15] S. I. Karaa and J. Zhan, "High order ADI method for solving unsteady convection diffusion